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Dynamics of Rip Currents and Implications for Beach Safety (DRIBS): A research and service provision partnership project

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Rip currents are strong and narrow offshore-directed currents in the surf zone that return water seaward that has been transported into the surf zone by breaking waves. Rip currents are found on high-wave beaches with bars and channels. Rip currents can be very strong with flow velocities of 1–2 m/s and are the main hazard to surf zone water users. According to lifeguard records, over 68% of incidents ('rescues') on UK beaches can be attributed to rip currents (1). A similar percentage is reported from Australia and the USA and, in Florida alone, over 100 people drown each year due to rip currents.

The importance of rip currents for beach safety is well recognised by coastal scientists and lifeguards, but we do not fully understand what controls their flow strength and pattern. Our understanding is particularly poor for rip currents on beaches with a large tide range. On some beaches, strong rips flow between bars and sweep swimmers out to sea, whereas on other beaches the rip current develops a large circulating eddy within the surf zone. The risks posed to surf zone water users will depend strongly on the type of rip circulation. We hypothesise that rip currents are strongest when all wave breaking occurs on the bar and none of the waves break in the rip channel whereby the rip generation mechanism is maximized. This depends on wave conditions, tide and bar morphology. All three factors vary over time and even subtle changes in any of them may have significant repercussions for the rip circulation. The overall aim of this project, Dynamics of Rip currents and Implications for Beach Safety (DRIBS), is to test this idea by measuring rip currents under a wide variety of wave, tide and beach conditions, and complementing the data analysis with computer modelling.

We will conduct two 6-week field campaigns on high-wave, large-tidal beaches in north Cornwall where simultaneous coast-wide mass rescue events involving up to 150 people have occurred due to rip currents. Each experiment will measure waves, tides and rip currents in the surf zone and specialist GPS drifters will measure the complete rip current circulation. The drifter tracks will provide useful information on the strength and the type of flow rip current pattern. The drifters are designed to behave like human beings and their movement therefore mimics that of passive bathers. The information collected during the field campaigns will be used to develop a computer model that is able to predict the rip flow pattern for any given wave, tide and beach condition. This model will be used to develop tools for lifeguards to determine the rip current risk and develop risk management strategies.

This three year research project, funded by the Natural Environment Research Council (NERC), involves a partnership between the University of Plymouth (UoP) and the Royal National Lifeboat Institution (RNLI) that has been developed through previous successful collaborations (1). The partnership is mutually beneficial, with the RNLI providing field support, and input on dissemination strategies. The research findings will be incorporated into the RNLI's lifeguard training, public education programs, risk assessment procedures and resource management tools through a carefully researched and comprehensive impact plan. The project aims to provide an example of how impact-lead, academic research can provide groundbreaking science and save lives through a well structured working partnership.

1.Scott, T. M., 2009. Beach morphodynamics and associated hazards in England and Wales. Unpublished PhD thesis. University of Plymouth, UK.

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